should have resulted in a lower total acidity and an even more marked diminution of the protein hydrochloric acid. At the operation a gumma of the liver was found which had become adherent to and invaded the pylorus.

The second analysis is that of the gastric contents of a woman who had suffered from gastric symptoms for four months:—

<table>
<thead>
<tr>
<th>Analysis</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total acidity</td>
<td>29</td>
</tr>
<tr>
<td>Total chlorides</td>
<td>0'183</td>
</tr>
<tr>
<td>Free HCl</td>
<td>0'000</td>
</tr>
<tr>
<td>Protein HCl</td>
<td>0'070</td>
</tr>
<tr>
<td>Mineral chlorides</td>
<td>0'113</td>
</tr>
</tbody>
</table>

In this case the degree of gastritis was rather greater than in the first case, and yet the history was much shorter. This, together with the fact that the patient had evidently lost flesh and was slightly anaemic, led to a diagnosis of carcinoma, which was confirmed by operation and successfully removed.

The results to be obtained by surgical treatment depend on early diagnosis. This is the key to success. My experience is that 18 per cent. of the patients remain free from recurrence for five years, and 27 per cent. for three years. I have had five patients who have lived for over ten years and then died from other causes. With earlier diagnosis and earlier surgical treatment the results would be incomparably better. It behoves us all to use every means at our disposal to perfect our diagnosis, so that we may recognize the disease early and urge operation before it be too late. It is by earlier operation, rather than by more extensive operation, that the results of the surgical treatment of cancer will be better in the future than they are to-day.

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**THE SURGICAL CLINICS OF VIENNA.**

*By REYNOLD H. BOYD, M.B., F.R.C.S. EDIN.*

**PART I.**

While the fame of various and scattered Continental clinics is known to the few, that of the Wiener group is known to all. It may be of use, then, to give some brief account of the facilities they offer to post-graduates.

It is difficult to see much in Vienna without the help of the American Medical Association, at 9, Alserstrasse, Wien VII. There, every evening, the operation lists are posted up. No fee is charged for attending operations and, as the theatres are spacious with well-arranged stands, a good view is always obtained. English, with a liberal admixture of American idiom, is spoken in all the clinics and the surgeons talk freely of their methods and cases. Classes in English can be arranged only through the American Medical Association. These tutorials are usually very good but the fees for them are rather high. The range of subjects, which are nominated by members, extends from proctology to cosmetic surgery.

On arrival in Vienna the best course is to take a taxi to the American Medical Association rooms, join the Association (the fee is about £3), and select suitable accommodation from their list of sponsored hotels, pensions and rooms. Taxis, food and lodging are all extraordinarily cheap.

While much may be gained from watching operations at the various clinics, the most outstanding features of surgical interest are the treatments employed by Böhler for accident cases and the universal use of local anaesthesia.

**The Arbeiter Unfallkrankenhaus.**

This is a highly-organised workmen's accident hospital, run at the expense of the
insurance companies. It is under the directorship of Professor Böhler, who is as impressive as are many of his methods. On the latter only comments will be given, as details appear in his book.

No injury is too trivial to merit a careful examination and just as careful treatment. Residual disability is at a minimum. These two statements really deserve repetition. Elaborate records are kept, complete with radiographs, photographs, and cinematograph strips of the range of movements at various stages in the treatment.

**Bruises and Sprains.**

The investigation for any possible fracture having proved negative, the affected part is immobilized for a week or more in plaster, applied extensively and directly to the skin. All bruises and sprains receive this treatment, and great importance is placed on this least spectacular part of the work. Special care is lavished on contused shoulders, which are put up in abduction until a range of 130° is obtained. Dislocations are also treated in abduction for six weeks. Clavicular dislocations receive the same period of immobilization with a pad over the lunation and blocks under the arms, held in position by straps.

**Wounds.**

Dressings are avoided at all costs, Böhler contending that compresses of exuded serum delay healing. The wound is cleansed and excised and sutured. The surroundings are immobilized in plaster with a window over the wound. Into this window is incorporated a wire grid, raised well above the wound surface, and on it dry sterile gauze is placed. The wound is thus perfectly open to the air. Results are extremely good with sepsis at a minimum as regards occurrence, duration and extent. It is impressive to see ugly palmar wounds progressing rapidly under such treatment. Here the fingers are extended and immobilized by adhesive strapping attaching them to a bent bar running up from its insertion into the plaster.

**Fractures.**

**Phalanges.—**Fractures of the fingers or toes are treated in extension by means of rustless wire drilled through the pulp and twisted just tight. The wire is fixed to a malleable splint, which may be bent to increase tension.

**Colles' Fractures.—**Colles' fractures are fixed in plaster in pronation. Wiring through the metacarpals is resorted to in badly comminuted cases.

**Fore-arm.—**Fractures of the radius and ulna are immobilized for eight weeks. Stress is laid on this longish time. The mid-prone position is adopted for the lower part and the supine for the upper part of the fore-arm. The fractures are treated in plaster, directly applied, after the insertion of rustless wire through the olecranon and the lower part of the radius and ulna. The wires and an anterior and a posterior plaque of wood are incorporated in the plaster. The plaques are of importance in maintaining the interosseous space.

**Supra-condylar Fractures.—**Great stress is placed on fixation in pronation to avoid varus angulation. Böhler proves his point conclusively by the use of a simple model.

**Femur.—**Extension is taken from a pin through the upper end of the tibia. The traction weight is equal to one-sixth of the body weight. The pin is retained for three weeks and fixation for ten or twelve weeks altogether. When the pin is removed a glycogelatin bandage is applied to the whole leg, and on this plaster round the thigh with tapes for extension and more round the leg, also with tapes and a sling or two. No plaster is placed round the knee. The slings are removed for daily movement of the knee, at ward-round time. A stepped hurdle is used to raise the knee and thus increase the range of flexion. Approximately 5 kgm. are applied for the thigh and leg respectively and
THE SURGICAL CLINICS OF VIENNA

1 kgm. for dorsiflexing the foot. The impressive factors in this method are that the patient is able to move himself freely on the second day and that there is at the end of the fixation period perfect mobility at the knee. After ten or twelve weeks the patient is allowed up in a glyco-gelatin bandage to prevent swelling at the knee and ankle. No walking caliper is used and the after-results are excellent.

*Tibia and Fibula.*—Ice-tong extension is taken from the os calcis for three weeks, after which the leg is immobilized in a plaster casing.

*Ankle.*—Pott's fractures are put up on a posterior plaster slab applied to the leg and foot. This is held in place by a bandage and a further application of plaster.

*Os Calcis.*—The number of cases of fractures of the os calcis diagnosed at this clinic is surprising. They receive elaborate treatment under local anaesthesia (injected into the fracture) or a spinal. A pin is entered through the insertion of the tendo Achillis and another through the soft parts under the tibia and fibula, a hand's breadth above the ankle-joint. In a special appliance tension is made obliquely downwards in the axis of the os calcis from the tendon pin, with vertical traction from the higher pin. A vice is then applied on both sides of the os calcis and tightened to secure the normal width of this bone. Next a well-moulded posterior plaster is applied to maintain the arches of the foot and the side-to-side pressure. Weight extension (3 kgm.) and the cast are left on for three to five weeks, depending on the amount of comminution, and a walking plaster is then applied for a further ten weeks.

**Ununited Fractures.**—A successful operation for synarthrosis was introduced into Vienna and extensively tried out by Böhler. Approximately twenty drill holes are made in radiating fashion through the bone ends from tenotomy wounds. The limb is immobilized for ten weeks.

**PART II.—LOCAL ANÆSTHESIA IN VIENNA.**

Courses in the administration of local anaesthesia are given in the Pathological Institute. All methods are demonstrated on the cadaver, and individual practice is encouraged.

**The Solution.**

Novocain, with adrenalin, is used.

\[1 \text{ c.c.} = 16 \text{ drops} = 1 \text{ mgm. of I in 1,000 adrenalin with 200 c.c. } \frac{1}{2} \text{ per cent. novocain solution, or 100 c.c. I per cent. novocain solution, or 50 c.c. 2 per cent. novocain solution, or 25 c.c. 4 per cent. novocain solution.}\]

Concentrated solutions are, of course, more dangerous than the weaker.

**Permissible Quantities.**

300 c.c. of \( \frac{1}{2} \) per cent. novocain solution may be used for infiltration without causing complications, and up to 500 c.c. given subcutaneously for a 2- to 3-hour anaesthesia is without danger. For the stomach 200 c.c. are used, and up to 150 c.c. more in an hour. On the other hand, 10 c.c. of a 4 per cent. solution injected into a scrotum or round and into a hydrocele may lead to severe complications, and if the same strength is used for teeth the rapid absorption from the gums may cause collapse.
Methods.

(1) Infiltration anaesthesia.
(2) Nerve anaesthesia.
(2) Combination anaesthesia.

In Particular.

Skin.—Skin wheals should be spaced at 2 cm. intervals, and from each an injection up to 10 cm. in length can be made inwards or outwards. The needle should not stop in its course, for the solution may then enter a blood-vessel. Some solution is injected on the way in and more on the way out. Ten minutes should elapse before incising.

Hernia.

A. Inguinal.—70 c.c. of $\frac{1}{2}$ per cent. novocain are injected into and below a rhombus-shaped area. At A (fig. 2) the first skin wheal is raised two fingers medial to the anterior superior iliac spine, and the conduction of the inguinal nerve is interrupted by injections made below "the first fascial resistance." Further injections are made from here, fanning towards the bone at B a wheal is raised over the pubic spine. The needle is sent down to bone, keeping the spermatic cord lateral. It is then inserted a further 2 cm., deeper and more lateral, into the cave of Retzius, where the pudendal nerve is interrupted, by 10 c.c. of $\frac{1}{2}$ per cent. novocain solution. Lastly, 10 c.c. are injected subcutaneously on each side of the rhombus and over the incision line (50 c.c.).

B. Femoral.—The inguinal nerve is interrupted as above and then the pudendal. A rhombus is again employed, the position and shape being modified to suit the altered site of the hernia.

Circumcision.

Using $\frac{1}{2}$ per cent. solution, a skin wheal is raised anteriorly at the base of the penis, and from here 20 c.c. are infiltrated subcutaneously round each side. Allow ten minutes to elapse. This technique may be used for paraphimosis; 40 c.c. are used in all.

Scrotum.

Infiltration is commenced anteriorly at the base of the penis and carried round each side of the scrotum. Three injection sites are necessary, and 80 c.c. $\frac{1}{2}$ per cent. solution are employed with another 10 c.c. subcutaneously for the skin incision. This is
sufficient for a hydrocele operation, but where the spermatic cord is to be severed 10 c.c. more must be previously injected into it.

**ABDOMINAL OPERATIONS.**

*Methods.*

(1) Upper abdomen: Splanchnic anaesthesia.

(2) Small intestine: As high spinal anaesthesia is dangerous, a general anaesthetic is given. Novocain, injected into the abdominal wall and mesentery, may be used for the "chronic appendix," though never, of course, for acute appendicitis.

(3) Lower abdomen: Spinal anaesthesia.

**Abdominal Wall.**

From each of five skin wheals 10 c.c. ½ per cent. novocain are injected deeply, in three fans, through the first fascial resistance and 10 c.c. subcutaneously up and down (fig. 6). The injection line is longer on the left side to allow extension of the wound avoiding the ligamentum teres. A medical subcutaneous injection of 10 c.c. is given for the incision. In all 150 c.c. are used at this stage. Fascæ and muscles are now insensitive and one may cut down fearlessly to the peritoneum, the incising of which, even, causes little pain.

**Peritoneum.**

When the peritoneum has been incised its deep surface is injected, 10 c.c. ½ per cent. novocain being used at 5 cm. intervals—20 c.c. per side usually. The needle is entered to a depth of 2 mm. Mesenteries are, of course, still sensitive. An injection of 10 to 20 c.c. (no more) ½ per cent. novocain into the small omentum will now permit a gastrostomy, or even a gastro-enterostomy, but adhesions negative this possibility. Nor can a gastrectomy be performed with this degree of anaesthesia.

**Splanchnic Anaesthesia.**

This is employed for operations on the stomach, duodenum, gall-bladder, pancreas, spleen, and transverse colon.

*Contra-indications.*

(1) Nervous patients.

(2) Adhesions between liver and stomach. Posterior splanchnic anaesthesia is possible but dangerous.

(3) Very fat subjects. The fat of the abdominal wall absorbs the local anaesthetic.

**Technique.**

Standing at the right side of the patient, the small omentum is tensed by drawing on the stomach with the right hand. As this draw on the stomach causes pain, ethyl chloride inhalation anaesthesia is sometimes given at this stage. It may, however, lead to vomiting, and a small injection into the small omentum is, therefore, more favoured. The liver is retracted and the ungloved left hand placed on the anterior surface of the vertebral column above the pancreas (11 or 12 dorsal). The bone should be clearly felt. A long, shouldered needle is sent along the middle finger, the second finger pushing the aorta aside, and the fourth feeling the inferior vena cava.

**Dangers.**

On account of the numerous veins in front of the vertebrae, it is essential to see
that no blood can be drawn off before the injection is made.

**Amount and Duration.**

Eighty to 100 c.c. \( \frac{1}{2} \) per cent. novocain are given; one and a half hours anaesthesia.

**Comments**

(1) Percaine is of little value where adhesions are present.

(2) While allowances must undoubtedly be made for the different temperaments of both patients and surgeons abroad, one cannot but be struck by the successful handling of this method of anaesthesia by such operators as Finisterer. "Groans of agony" are not heard and, if full red lips be any index, the patients appear to stand major operations extraordinarily well. Unfortunately the observer cannot take blood-pressure readings.

**Operations on the Thyroid Gland.**

General anaesthesia is used for exophthalmic cases and for the others the following local anaesthesia technique is employed:

A first wheal is raised one finger up from the centre of the suprasternal notch. From here 20 c.c. are injected on each side in half-moon fashion. Next, at the medial margin of the sterno-mastoid, on a level with the superior cornu of the thyroid cartilage, a 10 c.c. injection is given on each side. The needle is inserted horizontally to a depth of 2 to 3 cm. There should of course be no bleeding. The nerves with the superior thyroid artery, at the superior thyroid pole, are interrupted. From these points on the medial margins of the sterno-mastoid muscles 10 c.c. are injected subcutaneously on each side to the middle line. The use of fine needles is essential, on account of the numerous blood-vessels encountered.

It may be of interest to digress for a moment on Prof. Breitner and Graves' disease.

At the Eiselsberg Clinic iodine is used for five to seven days before and for two to three days after operation. A sleeping draught is given on the last night and morphia and atropin forty-five minutes before the patient is sent to the theatre. In restless cases Breitner supports or replaces local by general anaesthesia. He also favours the combination of gas and local. In very weak or senile cases he sometimes only ligatures the arteries, or at most will do an unfinished resection, tamponading the open neck wound with gauze. After one to two days the gauze is removed and the wound closed. In better risks he performs a symmetrical resection, leaving only a small amount of gland tissue. Glass drainage is employed for twenty-four hours. In only very large goitres are the neck muscles divided and not simply drawn aside.

**III.—Local Anaesthesia in Vienna.**

It may be well to mention here that no attempt is being made to cover the field of local anaesthesia completely, but rather to give, in moderate detail, those methods from which comparisons may be drawn.

**Fingers.**

Oberst Anaesthesia: A skin wheal is raised on the dorsum of the hand, 1 finger's breadth proximal to the metacarpo-phalangeal joint. From here on both sides 10 c.c. are infiltrated subcutaneously and towards the palmar surface of the finger. The needle is finally sent close up under the skin to raise another wheal on each side. From these second and third wheals 5 c.c. \( \frac{1}{2} \) per cent. novocain are injected anteriorly on each side. Altogether 30 c.c. are used.

**Contra-indications.**

(1) Inflammation at the base of the finger.

(2) Tendon-sheath infections.

For longer anaesthesia of an hour or more a rubber tube should be put on the base of the finger and round, figure-of-eight fashion, to the wrist.
**Fractures.**

One of the most interesting developments in local anaesthesia is its application to fractures. A fracture is usually located beneath the point of maximum tenderness. Here a needle is sent down through a "safe area," into the haematoma round the bone ends. The needle should be on bone, and it must be possible to withdraw blood before the 20 to 25 c.c. of 2 per cent. novocain are injected.

**Subperiosteal Fractures.**

Manipulations are here made possible by circular infiltration into the periosteum, and beneath it from four points round the limb. It should be noted that 4 per cent. novocain should never be injected beneath the periosteum, as it will lead to osteomyelitis.

**Joint Operations,**

e.g., knee for fractured patella, injured meniscus or cruciate ligament.

A skin wheal is raised two fingers up from and medial to the upper margin of the patella. A small incision is now made through which a long needle is inserted under the patella, avoiding the condyle. The needle must be mobile in the joint, and 50 c.c. 1 per cent. novocain are injected. The joint should be swollen and the patella ballotting. For the incision line 10 c.c. of ½ per cent. novocain are used.

**Arm and Forearm.**

Plexus or Kühlenkampf Anaesthesia: Half-way between the sternum and the lateral extremity of the clavicle, the first rib lies approximately in a vertical plane. A small needle is sent down on to the bone resistance of the first rib, one finger's breadth above the clavicle. By feeling the pulsation, the subclavian artery is kept below with a finger and the needle entered above it. If in going deep the rib be missed, the pleura and lung may be injured with serious results. The lateral side of the rib is picked up, and from here the needle is worked inwards in a fan series to the medial margin, where 40 c.c. 1 per cent. novocain are injected. This gives one hour of anaesthesia from the shoulder-joint down.

**Tonsils.**

Not more than 30 c.c. ½ per cent. novocain should be used. Four submucous injections of 5 c.c. ½ per cent. solution are given—at the superior and inferior poles and into the pillars half-way up each side.

**Mandibular Anaesthesia.**

This is employed for all operations on the mandible and teeth. The needle is entered into the mucous membrane in the triangle between the last molar and the vertical margin of the mandible. At a depth of 2 to 3 mm. bone is reached. It is then necessary to slide the needle back on the buccal surface of the bone for 2 cm. and here give 3 to 4 c.c. 1 per cent. novocain. The lingual nerve may be interrupted by injecting on the way back. Care must be taken not to go too far medial.

**The Gasserian Ganglion.**

The needle is inserted at a point 2 cm. lateral to the angle of the mouth and on the same horizontal plane as the mouth. It is sent backwards to the base of the skull, keeping strictly in two planes:—

1. A vertical one through the pupil of the eye on the same side.
2. A horizontal plane from the mandibular joint to the point of insertion of the needle.

![Diagram](http://pmj.bmj.com/)

The needle is worked down the base of the skull till it sinks into the foramen ovale. It is best to reach the base of the skull by going a little above the joint plane. This allows a small margin for working down when the required depth has been obtained.

An injection of 5 to 6 c.c. ½ per cent. novocain is made subcutaneously and the needle sent down to the bone. When the foramen ovale is found and no blood can
be withdrawn, 1 c.c. ½ per cent. novocain is given, followed by 1 c.c. 60 per cent. alcohol.

Spinal Anaesthesia.
In 9 per cent. of attempts no anaesthesia is obtained. A fine needle is essential to prevent damaging the leptomeninges and resulting headache from meningitis serosa.

Solutions.
Tropocain: 1 to 2 c.c. 5 per cent. strength. Must be mixed with the cerebrospinal fluid, of which 8 c.c. are used to make up to 10 c.c.
Novocain: 5 c.c. ½ per cent. strength. Collapse and fall of blood-pressure are frequent. Anaesthesia is better than that given by tropocain. Should be made up to 10 c.c. with cerebrospinal fluid after 5 c.c. have been discarded.
Spinocain: Serious complications possible.
Percaine: Not used.
The patient is kept horizontal with the head high.

Complications.
Immediate.—(1) Respiratory failure: Artificial respiration, and when some active respiration has been obtained (not before) carbon dioxide is given till the deeper movements indicate the necessity of oxygen.
(2) Cardiac failure: Lobeleine, 1 mgm., may be given subcutaneously. Caffeine citricum, 2 c.c. of 0·2 per cent. solution, into the spinal canal is also favoured. Adrenalin, 1 to 2 c.c. of 1 in 1,000, is injected into the heart itself, if the latter has stopped.
Remote.—The complications vomiting and headache, which occur two days later, are due either to low or high cerebrospinal fluid pressure.
Low pressure: 40 c.c. of 25 per cent. glucose should be given intravenously each day.
High pressure: 20 to 30 c.c. cerebrospinal fluid should be removed.

Contra-indications.
(1) Spinal anaesthesia should not be used for patients under 25 years of age.
(2) Spinal deformities.

Epidural or Sacral Anaesthesia.
This is not favoured in Vienna, being rated more dangerous, as regards collapse, than spinal anaesthesia. The pudendal nerve is not interrupted.
With the patient in the knee-elbow position, the needle is sent down to bone in the hiatus sacralis. It is then pushed 6 c.m. further up, and 40 c.c. ½ per cent. novocain are injected if neither blood nor fluid can be withdrawn. The sacral canal may, of course, be obliterated and it is difficult to find in fat subjects.

Parasacral Anaesthesia.
In this the sacral plexus is interrupted. With the patient on his back, the tip of the coccyx is palpated. One finger's breadth to each side a skin wheal is raised and the 15 cm. needle is sent from here straight backwards, parallel to the anterior surface of the coccyx. The bone resistance at the second parasacral foramen is felt at a depth of 7 to 8 cm. By going higher the first is reached at 10 to 11 c.m. When the needle has reached the first foramen it is withdrawn, 80 c.c. ½ per cent. novocain being injected over its whole course out. The other side is treated in exactly the same way. Operations may be performed on the rectum, bladder, prostate, uterus and vagina. As, however, the surroundings of the latter are not insensitive, a subcutaneous perineal novocain injection may be necessary.

Hæmorrhoids and Fissure-in-Ano, &c.
Skin wheals are raised at 12 and 6 o'clock close to the anal margin. From these two points subcutaneous, half-moon shaped infiltration is carried out round the anus, using 10 c.c. ½ per cent. novocain per side. With a finger in the anal canal the sphincteric contraction can be felt, and several injections are made into the muscle, 5 c.c. being given at each site through a needle inserted to a depth of 4 cm. parallel with the finger. In all no more than 80 c.c. ½ per cent. novocain are necessary.